REMARKS

This application has been carefully reviewed in light of the Final Office Action mailed on April 16, 2009, and the Advisory Action mailed on August 18, 2009. Applicant respectfully requests consideration of the foregoing amendment in light of the following remarks.

Summary of the Final Office Action and Advisory Action

In the Advisory Action mailed on August 18, 2009, the amendments to the claims as proposed in the After-Final response submitted by Applicant on July 16, 2009 were entered. However, the claims as amended were nonetheless rejected over the references of record for the reasons as indicated in the Final Office Action mailed on April 16, 2009.

In the Final Office Action mailed on April 16, 2009, claims 14-16 and 19-24 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over U.S. PG Pub. No. 2002/0110903 to Iwaki et al. (hereinafter referred to as "Iwaki"), in view of U.S. Patent No. 5,858,653 to Duran et al. (hereinafter referred to as "Duran"). Claims 14, 16, 17 and 18 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Iwaki in view of Duran, and further in view of U.S. Patent No. 6,159,695 to McGovern et al. (hereinafter referred to as "McGovern"). Claims 14, 24, 25 and 26 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Iwaki and Duran in view of the article to Allain et al. (hereinafter referred to as "Allain"). No other issues were raised.

Status of the Application

In the After-Final amendment submitted on July 16, 2009 and entered with the Advisory Action mailed on August 18, 2009, claims 14-15 and 24 were amended, and claims 25-26 were canceled. Upon entry of the present amendment, claims 14-21 and 23-24 will have been amended, and claims 21-22 will have been canceled. Accordingly, claims 1-20 and 23-24 remain pending in the application, with claims 1-13 being withdrawn as drawn to a non-elected invention.

Rejection of Claims 14-16 and 19-24 under 35 U.S.C. 103(a) over Iwaki and Duran

In the Office Action of April 16, 2009, claims 14-26 and 19-24 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Iwaki and Duran (*see, e.g.*, pages 3-8 of Office Action). This rejection is respectfully traversed.

Claim 14 is patentable over Iwaki and Duran because neither of the references teaches or suggests the method of producing the probe carrier having the probe that is specifically bindable to a target substance on the surface of the substrate as claimed, the method comprising:

> "providing *a solution containing a probe having a linker containing a first functional group and a silane coupling agent containing a second functional group* onto the surface of the substrate *as droplets by an inkjet method*; and
>
> immobilizing the probe on the surface of the substrate,
>
> wherein the surface of the substrate comprises one selected from the group consisting of glass, quartz, silica and a mixture thereof, and

wherein a combination of the first functional group and the second functional group comprises an acidic functional group and a basic functional group, and the first functional group and the second functional group are in the state of coupling without covalently bonding" (emphasis added)

That is, according to embodiments of the method as claimed, droplets of a solution containing *both* a probe having a linker containing a first functional group *and* a silane coupling agent containing a second functional group, are provided on a substrate by an inkjet method (*see, e.g.,* paragraph [0049 and Example 5 in instant Specification). For example, as described in Example 5 of the instant specification, a solution containing an aminosilane coupling agent and a DNA fragment (containing a linker with mercapto functional group) are simultaneously spotted on a slide glass by using a bubble jet printer, to immobilize the DNA fragment probe to the slide (*see, e.g.*, paragraphs [0063]-[0065] and [0081] – [0083]).

Iwaki does not teach or suggest providing droplets of solution containing *both* the probe with linker containing the first functional group *and* a silane coupling agent containing the second functional group, to a substrate via an inkjet method. Instead, in the section to which the Office Action refers, Iwaki teaches that "the solid carrier (I) having ionic reactive groups X^+ (e.g., amino groups $-NH_2$ or mercapto groups –SH) on its surface is brought into contact with probe molecules having an ionic group J- so that the solid carrier (IIIa) having the probe molecules electrostatically fixed on the carrier" (paragraph [0059]). Thus, Iwaki teaches bringing *probe molecules* into contact with ionic reactive groups on the surface of a *solid carrier* (e.g., substrate), and thus teaches providing a probe molecule to the substrate *separately from any silane coupling agent*. Iwaki does not teach or suggest providing a solution containing *both* a probe *and* a silane coupling agent to the surface of a substrate via an inkjet method, as in the claimed method.

Duran does not make up for the deficiencies of Iwaki. Instead, in the section of Duran referred to in the Office Action, it is taught that nucleic acid sequences appear to be attracted to the presence of ionic groups (*see, e.g.*, column 3, lines 21-33 and page 7 of Office Action). Thus, Duran also does not teach or suggest providing droplets of a solution containing *both* a probe *and* a silane coupling agent to the surface of a substrate by an inkjet method, as in the claimed method.

Accordingly, claim 14 is considered to be patentable over Iwaki and Duran for at least the reasons discussed above. Claims 15-16, 19-20 and 23 depend from claim 14, and thus are also patentable over the references for at least the same reasons as their base claim.

Furthermore, it is noted that various advantages are believed to be imparted by embodiments of the method as claimed, in which the solution containing both the probe and silane coupling agent are provided as droplets via the inkjet method. For example, a relatively simple production method using an electrostatic bond can be provided, as a separate step of uniformly applying a silane coupling agent can be omitted. Also, since the area of substrate spotted with the probe and coupling agent coincides, background noise can be prevented from increasing, such that blocking processing for reducing background noise may be unnecessary (*see, e.g.*, Example 5 and paragraphs [0055] and [0086] of publication of instant application). Such advantages are not taught or suggested by either Iwaki or Duran.

Claim 24 similarly recites a method of producing a probe carrier comprising "providing *a solution containing a plurality of probes each having a linker containing a first functional group and a silane coupling agent containing a second functional group* onto the surface of the substrate *as droplets by an*

inkjet method" (emphasis added), and thus this claim is also patentable over the teachings of Iwaki and Duran for at least the same reasons as claim 14.

Claims 21-22 is being canceled with the instant amendment, and thus the rejection of this claim over Iwaki and Duran is rendered moot.

Accordingly, the rejection of claims 14-16, 19-20 and 23-24 under 35 U.S.C. 103(a) over Iwaki and Duran is respectfully requested to be withdrawn.

Rejection of Claims 14, 16, 17 and 18 under 35 U.S.C. 103(a) over Iwaki, Duran and McGovern

In the Office Action of April 16, 2009, claims 14, 16, 17 and 18 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Iwaki, Duran and McGovern (*see, e.g.,* pages 8-10 of Office Action). This rejection is respectfully traversed.

Claim 14 is not obvious over Iwaki and Duran because, as discussed above, neither Iwaki nor Duran teach or suggest the method of producing the probe carrier having the probe that is specifically bindable to a target substance on the surface of the substrate as claimed, the method comprising "*providing a solution containing a probe having a linker containing a first functional group and a silane coupling agent containing a second functional group* onto the surface of the substrate *as droplets by an inkjet method*" (emphasis added). Instead, Iwaki teaches bringing *probe molecules* into contact with ionic reactive groups on the surface of a *solid carrier* (e.g., substrate) (*see, e.g.,* paragraph [0059]), but does not teach or suggest providing a solution containing *both* a probe *and* a silane coupling agent to the surface of a substrate, as in the claimed method. Duran provides a general teaching on the attraction of nucleic acid sequences to ionic groups (*see, e.g.,* column 3, lines 21-33), but also does not teach providing droplets of the solution as claimed.

McGovern does not make up for these deficiencies. Instead, in the section referred to in the Office Action, McGovern teaches a type of tether that can be attached to a solid phase oligonucleotide synthesis column (column 22, lines 53-67). Thus, the section of McGovern cited in the Office Action does not teach or suggest providing a solution containing *both* a probe *and* silane coupling agent *as droplets by an inkjet method*, and thus also does not teach or suggest the method as claimed. Claims 16, 17 and 18 depend from claim 14, and thus are also patentable over Iwaki, Duran and McGovern for at least the same reasons as their base claim.

Accordingly, the rejection of claims 14, 16, 17 and 18 under 35 U.S.C. 103(a) over Iwaki, Duran and McGovern is respectfully requested to be withdrawn.

Rejection of Claims 14, 24, 25 and 26 under 35 U.S.C. 103(a) over Iwaki, Duran and Allain

In the Office Action of April 16, 2009, claims 14, 24, 25 and 26 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Iwaki, Duran and Allain (*see, e.g.,* pages 10-11 of Office Action). This rejection is respectfully traversed.

Claim 14 is patentable over Iwaki and Duran because, as discussed above, neither Iwaki nor Duran teach or suggest the method of producing the probe carrier having the probe that is specifically bindable to a target substance on the surface of the substrate as claimed, the method comprising "*providing a solution containing a probe having a linker containing a first functional group and a silane coupling agent containing a second functional group* onto the surface of the substrate *as droplets by an inkjet method*" (emphasis added). Instead, Iwaki teaches bringing *probe molecules* into contact with ionic reactive groups on the

surface of a *solid carrier* (e.g., substrate) (*see, e.g.,* paragraph [0059]), but does not teach or suggest providing a solution containing *both* a probe *and* a silane coupling agent to the surface of a substrate by an ink jet method, as in the claimed method. Duran provides a general teaching on the attraction of nucleic acid sequences to ionic groups (*see, e.g.,* column 3, lines 21-33), but also does not teach providing droplets of the solution as claimed.

Allain does not make up for the deficiencies of Iwaki and Duran, because Allain also does not teach or suggest providing a solution containing *both* a probe *and* a silane coupling agent to the surface of a substrate by an ink jet method. Instead, Allain teaches a method in which *biological samples* are deposited onto membranes using a thermal ink-jet printer, for subsequent luminescence detection (*see, e.g.,* first full paragraph of right hand column of page 146), but does not teach or suggest that a solution containing *both* a probe, such as a probe having a mercapto functional group as claimed, *and* a silane coupling agent, such as one having an amino functional group, could advantageously be simultaneously imparted to a substrate via an inkjet method, as in the method as claimed.

That is, according to the method of Allain, *a biological sample* to be analyzed, such as the PCR-amplified genomic DNA from mice inoculated with the FHIT an E4 cell lines, is deposited by bubble-jet printing onto an immobilization membrane (*see, e.g.,* first full paragraph of right hand column of page 146). Allain further teaches that Cy5-labeled *probes* to the DNA samples were then added to a solution and *incubated with the immobilization membrane having the DNA sample deposited thereon* to hybridize the probes to the DNA sample (*see, e.g.,* sections entitled "Chemicals" and "Hybridization" of page 147). In other words, the labeled *probes* were *not deposited via bubble-jet printing*, but instead were contacted with the immobilization membrane having the DNA sample thereon *via incubation therewith in solution*. The Cy5 probe emission signal was then detected to evaluate the hybridization results (*see, e.g.* Fig. 3

and section entitled "Instrumentation" on pages 147-148). Thus, while Allain teaches using a bubble-jet printing method to deposit a *biological sample* on a membrane, Allain does not teach or suggest using such a method to deposit *probes* on the substrate, let alone a solution of *both* probes *and* silane coupling agents, such as probes having a mercapto functional group that binds ionically to an amino functional group of the silane coupling agent.

In contrast, as discussed above, it is noted that various advantages may be imparted by embodiments of the method as claimed, in which the solution containing both the probe and silane coupling agent are provided as droplets via the inkjet method. For example, a relatively simple production method using an electrostatic bond can be provided, as a separate step of uniformly applying a silane coupling agent can be omitted. Furthermore, since the area of substrate spotted with the probe and coupling agent coincides, background noise can be prevented from increasing, such that blocking processing for reducing background noise may be unnecessary (*see, e.g.,* Example 5 and paragraphs [0055] and [0086] of publication of instant application). Such advantages are not taught or suggested by either Iwaki, Duran or Allain.

Claim 24 similarly recites a method of producing a probe carrier comprising "providing *a solution containing a plurality of probes each having a linker containing a first functional group and a silane coupling agent containing a second functional group* onto the surface of the substrate *as droplets by an inkjet method*" (emphasis added), and thus this claim is also patentable over the teachings of Iwaki, Duran and Allain for at least the same reasons as claim 14.

Claims 25-26 were canceled in the After-Final Amendment submitted on July 16, 2009 and entered with the Advisory Action mailed on August 18, 2009, and thus the rejection of these claims over Iwaki, Duran and Allain is rendered moot.

Accordingly, the rejection of claims 14 and 24 under 35 U.S.C. 103(a) over Iwaki, Duran and Allain is respectfully requested to be withdrawn.

CONCLUSION

Applicant respectfully submits that all of the claims pending in the application meet the requirements for patentability, and respectfully requests that the Examiner indicate the allowance of such claims. Any amendments to the claims which have been made in this response, and which have not been specifically noted to overcome a rejection based upon prior art, should be considered to have been made for a purpose unrelated to patentability, and no estoppel should be deemed to attach thereto.

If any additional fee is required, please charge Deposit Account Number 502456. Should the Examiner have any questions, the Examiner may contact Applicant's representative at the telephone number below.

Respectfully submitted,

9/15/2009

Date

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